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ABSTRACT

This report presents existing workforce levels, training programs and career potentials and develops staffing level projections (1976-1982) based on available information for the Commonwealth of Puerto Rico. The study concerns itself with the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, wastewater, and energy. The format includes workforce profiles, projections, growth and career options for each of the areas investigated. Additional sections of the report outline state legislation and selected post secondary institutions with formal Environmental/Energy programs. A state profile and summary is included for cross-reference. The selected bibliography is appended in the Region II report. This document is one in a series of 69 which presents information for each of the states, Washington, D.C., and the Virgin Islands, and national and regional summaries. (CS)

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ED147153

A National Environmental/Energy Workforce Assessment



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SE 023 331

NATIONAL ENVIRONMENTAL/ENERGY
WORKFORCE ASSESSMENT

for

PUERTO RICO

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

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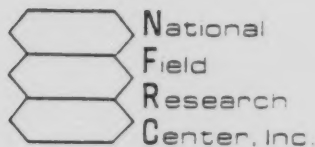
UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

1977

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Box 287

Iowa City, Iowa 52240

(319) 351-8789

INTRODUCTORY NOTE

The National Environmental/Energy Workforce Assessment was conducted by National Field Research Center, Inc. with main offices in Iowa City, Iowa. The following personnel have had primary responsibility for the Assessment and project report.

IOWA CITY, IOWA

Dr. Darold E. Albright, President
Paul E. Bridges, Executive Director
Dr. Richard L. Benesh, Project Director
Judith J. Gordon
Alan M. Stowell
Anita M. Stowell
Mary Kay (Edge) Wade

ATLANTA, GEORGIA

Elizabeth G. Nielsen, Regional Director
Robert Oxberger

DENVER, COLORADO

Nancy C. Dillenberg, Regional Director

SEATTLE, WASHINGTON

Steven Silva, Regional Director

WASHINGTON, D.C.

Frank E. Smith, Project Coordinator
Lloyd B. Chaisson, Assistant Project Coordinator
Jack F. Seum

Additional research and clerical assistance was provided by Frederick M. Wall, Maxine Wolfe, Margaret Fehn, Sandra Hogsed, Karen Kirchoff, Sharon Leiker, Marilyn Low, Mary McCormac, and Joan Urquhart.

FIELD OFFICES

ATLANTA
2700 Cumberland Pkwy
Suite 150
Atlanta, GA 30339
(404) 433-2844

DENVER
2600 S. Parker Rd.
Suite 160, No. 6
Denver, CO 80232
(303) 751-4962

SEATTLE
927 United Pacific Bldg.
1000 2nd Ave.
Seattle, WA 98101
(206) 623-9170

WASHINGTON D.C.
1822 K Street, N.W.
Suite 600
Washington, D.C. 20005
(202) 223-9138

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PREFACE

This report presents existing workforce levels, training programs, and career potentials and develops staffing level projections (1976 - 1981) based on available information for the Commonwealth of Puerto Rico in the environmental pollution control areas of air, noise, pesticides, potable water, radiation, solid waste, waste water, and energy. This study was carried out for the United States Environmental Protection Agency by National Field Research Center of Iowa City, Iowa.

The information and data presented in this report were compiled in large part from extensive interviews with professionals working in the respective areas and were supplemented by telephone surveys and research.

FOREWORD

The material herein contains the information and data collected for eight individual pollution control inventories conducted for Puerto Rico. The format includes workforce profiles, projections, growth and career potential for each of the areas investigated. Growth projections are necessarily based on best professional estimates developed from available information and represent what are felt to be realistic figures by experts in the respective areas. The pollution control areas considered by this study are as follows:

Air

Noise

Pesticides

Potable Water

Radiation

Solid Waste

Waste Water

Energy

National Environmental Energy
Workforce Assessment

Phase I

PUERTO RICO

Territorial Summary

I. AIR

Protection of Puerto Rico's air quality is a function of the Commonwealth's Environmental Quality Board (EQB). Pollution control and abatement activities are located in the Air Quality Bureau, which is under the direction of the Associate Director for Air and Water. There are no local or municipal agencies with any responsibilities for air pollution control.

The Air Quality Bureau is composed of a Permit and Engineering Division and a Complaints and Surveillance Division. In addition, air pollution control personnel are also located in the Office of the Associate Director for Air and Water and in the Laboratory and Sampling and Data Management Bureaus, which support the water quality program as well as the air program.

The air pollution program has a current staffing level of 43 persons which includes 28 full-time persons on the program and 15 persons who devote approximately half time to air pollution functions. This equates to 36 person-years spent on the program. The program is staffed with engineers, chemists, natural resources specialists, meteorologists and natural resources technicians.

Activities in the air pollution program are expected to increase as a result of several specific functions to be carried out in the next few years. These functions include: air quality maintenance planning, compliance and permits, NSPS and NESHAPS programs, and sampling and laboratory activities. It is likely that career potential in Puerto Rico's air program will be for engineers, technicians, and natural resource specialists.

II. NOISE

Puerto Rico's regulation of noise pollution is covered under the Commonwealth's Environmental Policy Law and administered by the Environmental Quality Board (EQB). In addition to environmental noise, the Commonwealth also has an "unnecessary noise" law which is under the jurisdiction of the Department of Public Works. The only municipality in the Commonwealth which has a noise ordinance is San Juan.

There are currently three persons working in the Noise Bureau within EQB. Two of these persons are natural resources specialists and the third is a noise inspector, a position which does not require college training. Additionally, the Bureau is authorized one engineer, as program director; however, this position is currently vacant.

Program officials indicate that the present workforce level is not adequate to administer the program effectively, and that a total of 18 persons would be necessary for proper enforcement. It is estimated that the program's vacant engineering position will be filled in 1977, bringing the program to authorized strength. It is also projected that two additional people will be hired in 1979, an engineer and a natural resources specialist. Officials were unable to make projections beyond 1979 but indicated that turnover is expected to be negligible. Although there will be few positions available, those that do exist will require professional training in engineering or the physical sciences. with some background in acoustics being desirable.

III. PESTICIDES

In the Commonwealth of Puerto Rico, the Department of Agriculture has been designated as the lead agency for the administration of the pesticide applicator certification program. The Commonwealth's Certification Plan is administered by the Department's Analysis and Registration of Agricultural Materials Laboratory.

The Laboratory is staffed with twelve persons including chemists, agronomists (inspectors), a laboratory assistant and secretaries. One person has a position of Liaison Officer-Pesticides, who devotes full-time to the Certification Program. The applicator training is administered by the Commonwealth Cooperative Extension Service which has an Extension Training Coordinator and seven coordinators. They receive additional assistance from about 100 county agents.

It is estimated that approximately 1,000 commercial applicators and 25,000 private applicators will need to be certified. Several additional positions have been requested by the Department for the Certification Program during 1977. The laboratory has one vacant inspector position which is expected to be filled, and one additional inspector has been requested for the program. One executive administrative officer and a laboratory assistant may be recruited by the end of 1977. It is anticipated that with the additional requested personnel on board, the laboratory's pesticide staffing will increase to a total of fifteen. Further projections beyond 1977 were unobtainable, but it is thought by Department professionals that the total staff of sixteen would be adequate for the duration of the five year period 1977-81.

IV. POTABLE WATER

Puerto Rico's potable water program is administered by the Commonwealth's Department of Health. There are no laws or regulations specifically relating to water supply; consequently, the Commonwealth cannot obtain primacy under the Safe Drinking Water Act (SDWA). The Puerto Rico Aqueduct and Sewer Authority (PRASA) has responsibility for the construction, operation, and maintenance of the public water treatment facilities. These facilities are all owned and operated by PRASA.

The Health Department currently has seven persons working full-time in the water supply program: one engineer, four environmental health officers, and two inspectors. In addition, there are 50 inspectors in the Health Department who devote approximately 30 percent of their time to the potable water program.

Substantial growth in the water supply program is anticipated in the next two years as the Health Department expands its activities to bring the program into compliance with federal standards and assumes primacy under SDWA. An additional engineer is expected to be utilized for the Department's plan review program, and a chemist, bacteriologist, and secretary will be necessary to increase laboratory capabilities for the lab certification program. Several additional Environmental Health Officers will be hired, probably in 1978, to handle program activities in each of Puerto Rico's seven regions.

V. RADIATION

All of Puerto Rico's radiation control activities are located in the Radiological Health Program of the Commonwealth's Department of Health. The Program has four basic areas of responsibilities which include X-ray survey and control, radioactive materials, non-ionizing radiation, and planning and administration. The X-ray survey and control function is the largest and is concerned with the registration and inspection of X-ray machines to ensure compliance with regulations.

There are currently ten full-time and two part-time persons in the Radiological Health Program. Other than the radiological health director, the Program employs five radiological health specialists, one radiological health technician and three supportive personnel. The radiological health specialist position requires a bachelor's or graduate degree in engineering, biological, or physical sciences.

No projections regarding the growth/decline of personnel or turnover in the Radiological Health Program were available. The program has experienced funding difficulties over the past few years and now receives about fifty percent of its support from the federal government. Future jobs will probably require professionals with degrees in engineering or the natural sciences. There may also be some opportunity for technicians with a high school education.

VI. SOLID WASTE

Implementation of the solid waste program in Puerto Rico is the responsibility of the Commonwealth's Environmental Quality Board (EQB). The Board has a Bureau of Solid Waste which is under the direction of the Associate Director for Noise and Solid Waste.

The Bureau of Solid Waste has a current staffing level of 15 persons. The Bureau is composed of engineers, biologists, sanitarians and an environmental technician. The program's two engineers have degrees in either mechanical or civil engineering.

The primary method of solid waste disposal in Puerto Rico is the landfill. There are 38 licensed landfills in the Commonwealth, and these are municipally owned and operated. Officials of the Bureau estimate that there are approximately 150 persons working in landfill operations.

Program officials within the Bureau of Solid Waste anticipate that the workforce will double by 1978. They indicate that program expansion is consistent with EPA's solid waste program and with the recently enacted Resource Conservation and Recovery Act. Career opportunities will continue to be greatest for persons with professional training in engineering and the sciences. The largest increase can be expected to occur in 1978 and several more people will be added in 1979. At this point the workforce will stabilize with little, if any, future growth foreseen during the remainder of the next five year period. Officials also indicate that they expect position requirements to remain substantially the same.

VII. WASTEWATER

Primary responsibility for the wastewater program in Puerto Rico rests with the Water Quality Bureau and the Water Resources Management Bureau under the direction of the Associate Director for Air and Water of the Environmental Quality Board (EQB). Created in 1970, the EQB is responsible for the implementation of the Federal Water Pollution Control Act Amendments (FWPCA) as well as Puerto Rico's water quality regulations. Although EQB is responsible for water quality management activities, another agency, the Puerto Rico Aqueduct and Sewer Authority (PRASA), has responsibility for the construction, operation, and maintenance of all public wastewater facilities.

The staffing of the water quality program in the EQB consists of a total of 87 people. Seventy-one work on the water program while 16 divide their time between the water and the air programs. An overall growth rate of about five percent per year is viewed as realistic, with the greatest demand for engineers. Workforce growth in the EQB is estimated to be small although increased activity in each of the program functions is anticipated.

The Puerto Rico Aqueduct and Sewer Authority (PRASA) is divided into four operational areas: Operation, Engineering, Administration, and Commercial Relations. There are 100 public sewage treatment plants in Puerto Rico and five or six industries have their own treatment facilities. Field Research suggests that there are more than 4,000 people currently working in PRASA.

VIII. ENERGY

Energy matters in Puerto Rico are the concerns of three distinct Commonwealth agencies: the Department of Consumer Affairs, the Office of Petroleum Fuels Affairs, and the Puerto Rico Water Resources Authority (PRWRA), which is the island's electric power utility. The Department of Consumer Affairs has designated an Energy Group to promote energy conservation planning and has submitted a proposed energy conservation plan for the Commonwealth to FEA.

Puerto Rico now has a developed petroleum refining industry which provides most of the Commonwealth's energy needs. Although the Commonwealth is still largely dependent on imported fuel, it now exports considerable amounts of energy.

Following the energy crisis in 1973, Puerto Rico developed a program to conserve energy within government institutions and to promote energy conservation by the general public. The proposed energy conservation plan is perceived as a first step toward attainment of a comprehensive strategy. Solar energy is particularly attractive because of the climate in the Commonwealth. The government plans a massive use of solar devices in new housing construction. The Commonwealth has also developed an educational program which is designed to influence the public attitude and to induce people to adopt energy conservation practices. Demonstration projects will also be developed under this program.

COMMONWEALTH OF PUERTO RICO - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR ¹	28	36	38	40	42	44	10%
NOISE ²	3	4	4	6	6	6	17%
PESTICIDES ³	122	124	124	124	124	124	.4%
POTABLE WATER ⁴	7	11	18	18	18	18	24%
RADIATION ⁵	10						N/A
SOLID WASTE ⁶	15	18	29	36	36	36	21%
WASTEWATER ⁷	71	74	78	82	86	91	5%
ENERGY ⁸							N/A
TOTALS	256	267	291	306	312	319	5%

¹The above represents full-time personnel of the Environmental Quality Board (EQB).

²The above includes EQB personnel but does not include law enforcement personnel.

³The above includes public sector personnel but does not include an estimated 968 commercial and 25,000 private applicators that will require certification.

⁴The above includes only personnel of the Health Department and does not include water supply and water treatment plant operators for which figures were not available.

⁵The above includes only full-time personnel of the Health Department. Projections of workforce needs were not available.

⁶The above includes only EQB personnel and does not include municipal landfill operators.

⁷The above includes only full-time personnel of EQB and does not include wastewater treatment plant operators for which figures were not available.

⁸No figures were available at the time of the preparation of this report.

EDUCATION

A Bachelor's level program in Environmental Management is offered through the University of Puerto Rico, Rio Piedras Campus. The program emphasizes a curriculum in basic sciences. The Mayaguez Campus offers a Bachelor's program in Engineering and Agricultural Sciences. The University of Puerto Rico, a commonwealth-funded, public institution, has four campuses: Rio Piedras, Mayaguez, Cayey, and Humacao. The University of Puerto Rico had a total enrollment of 51,061 during academic year 1976-77.

A system of five regional colleges, similar to the community college systems of many states, has commonwealth sponsorship. The five regional campuses are located in Aguadilla, Arecibo, Bayamon, Carolina, and Ponce. No information was obtained regarding environmental programs at the regional colleges.

There are several private post-secondary educational institutions located in Puerto Rico. The Inter American University of Puerto Rico has an extensive campus system. Courses are available through nine campuses: Hato Rey, Arecibo, Barraquitas, Bayamon, San German, Aguadilla, Fajardo, Guayama, and Ponce. The University offers a less than four-year program. Information is presently lacking as to whether environmentally-related programs are offered through the University.

LEGISLATION

The environmental/energy legislation for Puerto Rico was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Organic Act of the Department of Natural Resources
Law on the Control of Air Pollution
Economic Poison Act

National Environmental Energy
Workforce Assessment

Phase I

PUERTO RICO

Territorial Report

COMMONWEALTH PROFILE

Puerto Rico is the easternmost and smallest of the West Indies islands known as the Greater Antilles. It lies between the Atlantic Ocean to the north and the Caribbean Sea to the south and is approximately 1,600 miles from New York City and 900 miles from Miami. The island is hilly and has a mild tropical climate with a mean temperature of 76 degrees. It is about 105 miles long and 35 miles wide.

Puerto Rico was discovered in 1493 by Christopher Columbus and remained under Spanish control until 1898. At that time it was ceded to the United States as a result of the Spanish American War. In 1917, an Act of Congress made the people of Puerto Rico citizens of the United States and on July 25, 1952, Puerto Rico attained the status of a free commonwealth associated with the U.S.

The population of Puerto Rico, according to a 1976 estimate, is 3,112,000, with almost a half a million people living in San Juan, the island's capital and largest city. San Juan is also the center for the Commonwealth's commercial and tourist trade.

Puerto Rico derives its largest income from manufacturing, an estimated \$1.8 billion worth in 1975. Major products include textiles and apparel, electrical and electronic equipment, plastics, chemicals, petrochemicals, petroleum products, processed foods, metals, and leather.

The island has been moving from a predominantly agrarian economy to an industrial one, but agriculture is still an important source of income for Puerto Rico. Twenty-five years ago sugar cane, coffee, and

tobacco accounted for two-thirds of the agricultural production, but now these crops account for less than 40 percent of the total, while dairy, livestock, and poultry have gained in importance. Total farm income for 1975 was \$333 million.

Mineral production is primarily limited to construction materials, with cement accounting for a large part of the value.

PUERTO RICO POLLUTION CONTROL AND ABATEMENT AGENCIES

Puerto Rico's environmental activities are under the jurisdiction of three Commonwealth agencies, the Environmental Quality Board (EQB), the Puerto Rico Department of Health, the Department of Agriculture, and the Puerto Rico Aqueduct and Sewer Authority (PRASA).

In 1970, Puerto Rico enacted the Public Policy Environmental Act, also known as Law Number 9, which created the EQB and established the Commonwealth's public policy toward the environment. The Board was granted the authority to perform various functions, all in furtherance of the Commonwealth's public policy. EQB is designated to act as the Commonwealth's agency for all matters related to the Federal Water Pollution Control Act Amendments, the Clean Air Act, the Solid Waste Disposal Act, and any other federal laws relating to environmental and natural resources conservation.

EQB is divided into two sections, each headed by an Associate Director of EQB. The Air and Water Section contains separate Air and Water Bureaus and has responsibility for the air pollution and wastewater programs. The Noise and Solid Waste Section is similar to the Air and Water Section and is composed of separate Noise and Solid Waste Bureaus and has responsibility for these programs.

The Department of Health has responsibility for the Commonwealth's water supply and radiation activities and performs these activities within the Department structure through the Water Supply

Program and the Radiological Health Program. The pesticide program is carried out by the Analysis and Registration Division of the Agricultural Materials Laboratory in the Puerto Rico Department of Agriculture.

PRASA can best be described as the Commonwealth's public works agency for water and wastewater treatment. This agency owns, builds, operates, and maintains all of Puerto Rico's public water and wastewater treatment plants and sewage system. There are no local or municipal treatment facilities for sewages on the island. PRASA is divided into four operational Areas: The Area of Operations, Area of Engineering, Area of Administration, and Area of Commercial Relations. The Area of Operations is divided into three sections: Sewers, Water Facilities, and Maintenance. These sections are responsible for the agency's functions of operation and maintenance and comprise most of the environmental activities of PRASA. The Area of Engineering is responsible for construction of facilities.

Figure 1

Commonwealth of Puerto Rico
ENVIRONMENTAL QUALITY BOARD (EQB)

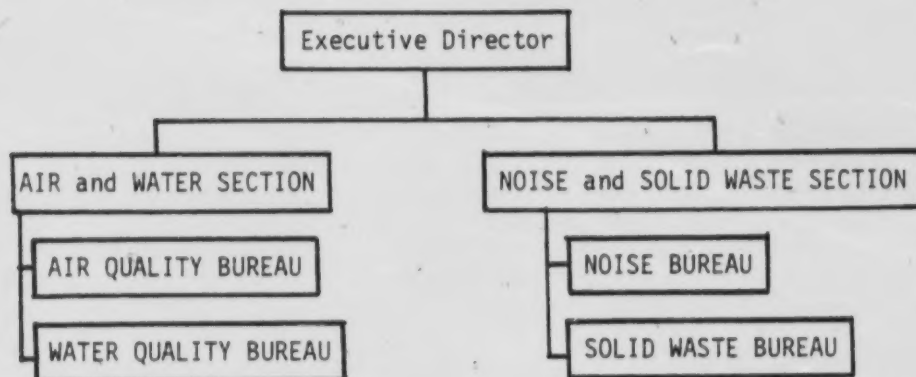
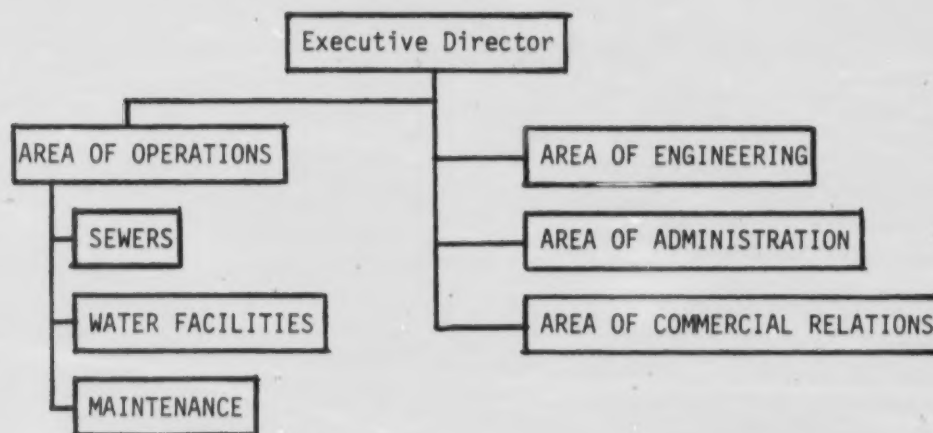


Figure 2

Commonwealth of Puerto Rico
PUERTO RICO AQUEDUCT AND SEWER AUTHORITY (PRASA)



Pollution Control and Abatement Programs

I. AIR

A. Introduction

Protection of Puerto Rico's air quality is a function of the Commonwealth's Environmental Quality Board (EQB). Pollution control and abatement activities are located in the Air Quality Bureau which is under the direction of the Associate Director for Air and Water. This is the only public agency in the Commonwealth which has authority for air pollution control and the authority extends to all jurisdictions in the Commonwealth. There are no local or municipal agencies with any responsibilities for air pollution control.

The Bureau continually evaluates and processes all permit applications submitted by the emission sources located in the Island as required by Article 3 of Puerto Rico's Air Pollution Control Regulation (APCR). During FY 1976 there were 125 applications for construction permits to the Environmental Quality Board. It should be noted that this total number of applications received was less than in the previous years; a reflection of the economic recession the Island has experienced. Consequently, operating permit applications were reduced from 350 in FY 1975 to 256. This includes renewal requests for expired permits.

One of the most active parts of the Air Quality Bureau (AQB) was that of field surveillance to determine compliance of point and non-point sources. The AQB is the unit responsible for source compliance, permits, complaints investigations, surveillance, stack

sampling and the overall development of the Air Pollution Control Program (APCP).

For non-point sources, the Bureau made 275 inspections during FY 1976, 82 percent over estimates for that period. Another activity undertaken by the Program is to inspect and analyze the operations of 134 point sources (as defined by EPA in written agreement with EQB) to insure compliance with SIP. It should be pointed out that the number of sources in compliance with regulations has increased 31 percent during the second part of Fiscal Year 1976. This is mainly due to the compliance of eleven sugar mills operating in Puerto Rico and the surveillance activities conducted by the AQB. The Air Quality Bureau is carrying on stack samplings for new stationary sources to assure their compliance with Federal Regulations.

Other activities of the AQB include the inspection and investigation of complaints related to the emission sources in Puerto Rico. During the last fiscal year, it was projected that about four hundred complaints were to be processed; but, due to the development of intensive surveillance programs, only 324 complaints were received.

For the purpose of planning and evaluating the environmental impacts generated by the industrial development in Puerto Rico, the AQB evaluated 121 environmental impact statements in FY 1976, which is 19 fewer than projected. This also reflects the impact of economic recession on Puerto Rico.

As part of the implementation of the new Article 6.1 of the APCR, a sampling and surveillance activity for all the combustion sources located in Puerto Rico has been established. This activity includes field inspections at least twice a year to all the combustion sources affected by the new strategy and the chemical analyses of the fuel oil used by those sources.

The air program shares laboratory and sampling activities with the water quality program, also located in the EQB. There are a total of fourteen sampling stations currently in operation with an additional twelve proposed by program officials as being necessary for the measurement of high concentrations of SO_2 . In addition, EQB operates five of the above stations plus three others in a combined effort with the Puerto Rico Water Resources Authority (PRWRA) which is the Commonwealth's electric power supplier, and operates five of the above sites for EPA under the National Air Surveillance Network. The Laboratory and Sampling Bureau is also responsible for fuel sampling and analysis projects to enforce the regulations concerning sulfur content in fuels and participates in source or stack sampling projects.

There is only one Air Quality Control Region (AQCR) in Puerto Rico as indicated in figure 3, which illustrates the 1976 status of air quality standards. In addition, there are 137 major installations in Puerto Rico which are capable of emitting over 100 tons of pollutants each year. As of June 30, 1976, 89 of these

installations were in compliance with regulations, 42 were in violation, and the status of six facilities was unknown.

Figure 3

COMMONWEALTH OF PUERTO RICO

Attainment Status of National Ambient Air Quality Standards
by Air Quality Control Region¹

AQCR \ Pollutant					
	TSP	SO ₂	CO	O _x	NO ₂
PUERTO RICO	AR	MR	2	2	

¹"X" indicates non-attainment of an applicable NAAQS, but no call for a SIP revision.

"AR" indicates non-attainment of an applicable NAAQS and a call for a SIP revision for attainment and maintenance.

"MR" indicates attainment of an applicable NAAQS, however, a SIP revision for maintenance is necessary.

A blank indicates attainment of an applicable NAAQS and no calls for SIP revisions.

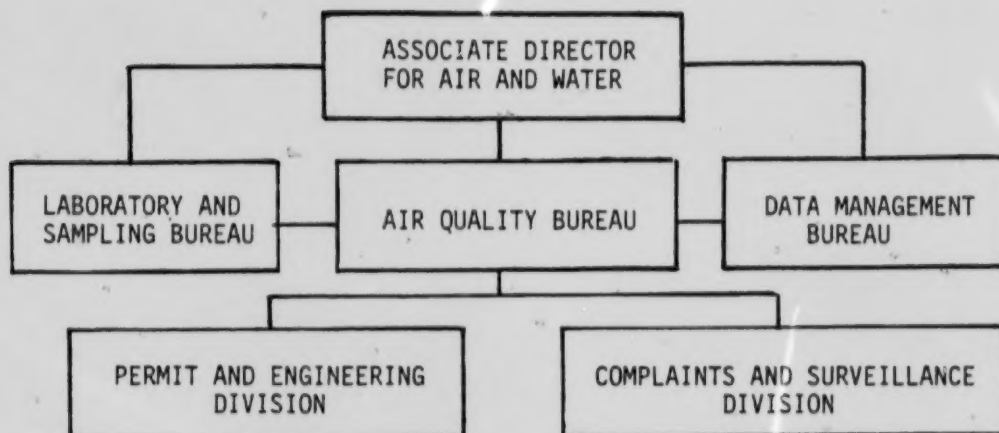
²No or insufficient air monitoring data available. Attainment status is based on one or more of the following considerations:

- (a) diffusion model
- (b) emission inventory
- (c) historical or incomplete data base
- (d) measured air quality in adjacent AQCRs.

B. Workforce Profile

The information in this section was obtained primarily through on-site interviews with professionals working in the air pollution program and from materials and documents supplied by them.

The Air Quality Bureau is composed of two divisions shown as follows:



In addition, air pollution control personnel are also located in the Office of the Associate Director for Air and Water and in the Laboratory and Sampling and Data Management Bureaus which support the water quality program and the air program.

The air pollution program has a current staffing level of 43 persons which includes 28 persons full-time on the program and 15 persons who devote approximately half of their time to air pollution functions. This equates to 36 person-years spent on the program. Table I below illustrates the occupational categories of the 28 persons working full-time on the program. They can be divided into six categories; the largest is engineers. These are professional positions which require a four-year degree in a specific engineering discipline. The chemists, natural resources specialists, and the meteorologist are also professionals, with job requirements specifying a four-year degree in a physical or natural science. The technicians are natural resources technicians, are

not required to have a college education, and perform most of the sampling and surveillance activities. Those persons classified as "other" include an electrician, two laboratory workers, and four secretaries.

The fifteen persons who spend half time on the air program include 3 engineers, 2 natural resources specialists, 3 statisticians, a training officer, an administrative officer, and 5 secretaries. These persons devote the remaining 50 percent of their time to the water quality program.

It should also be noted that there is a 20 percent vacancy rate in the program and a turnover rate of approximately three to four percent per year. The reason for the high vacancy rate, according to program officials, is the relatively low salaries available at EQB when compared with private industry and with salaries paid for comparable positions in the continental United States. Many Puerto Ricans educated in the continental U.S. will not return to the Commonwealth because of the salaries.

TABLE I

COMMONWEALTH OF PUERTO RICO

Air Pollution Control Public Sector
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Engineer	8
Chemist	3
Meteorologist	1
Technician	7
Natural Resources Spec.	2
Other	<u>7</u>
TOTAL	28

C. Workforce Projections

The data contained in this section are based upon the best professional judgements of personnel working in the air pollution control program and through the use of materials supplied by them.

Activities in the air pollution program are expected to increase as a result of several specific functions to be carried out in the next few years. As described in the Air Quality Bureau's annual report for FY 1976, several of the activities requiring an increased workforce include:

Air Quality Maintenance Planning. Professionals have indicated that additional personnel will be needed in the analysis of alternate control strategies, the selection of a final control strategy and the development of a comprehensive air quality strategy as required by the Federal Water Pollution Control Act Amendments (FWPCA).

Compliance and Permits. The Bureau estimates that additional manpower will be required for a projected increase in surveillance activities in order to bring non-significant sources in compliance with the law.

NSPS and NEHASPS Programs. If Puerto Rico is delegated the enforcement activities under these programs, Bureau officials have indicated that an additional three persons will be required for these functions.

Sampling and Laboratory Activities. An increase in sampling and analysis is anticipated by program professionals and in order to bring the program into compliance with the SIP, additional monitoring stations must be established. They have estimated that an additional four technicians and one chemist will be required in 1977.

Following these anticipated increases in staffing, program officials indicate that future increases will probably be very small, occurring at a rate of about five percent per year. This is illustrated in Table III. The vacancy rate and turnover are expected to remain the same as discussed in the previous section, unless the salary structure is changed during the next five years.

TABLE II
COMMONWEALTH OF PUERTO RICO
Air Pollution Control Public Sector
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	8	9	10	10	11	11		7%
Chemist	3	4	4	4	5	5		12%
Meteorologist	1	1	1	1	1	1		N/A
Technician	7	11	11	12	12	13		15%
Natural Resources Specialist	2	4	5	6	6	7		32%
Other	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>		N/A
TOTAL	28	36	38	40	42	44	3%	10%

D. Training and Certification

Air pollution control training in Puerto Rico is the responsibility of the Associate Director for Air and Water, EQB. During FY 1976, he established the position of manpower training officer. It is the responsibility of this person to coordinate both air and water quality training programs and approximately half-time is spent in each.

Since the inception of this position, the training office has been organizing and programming a series of seminars and conferences for EQB personnel and, in some cases, for other governmental agencies. In setting up the training programs, EQB enlisted the assistance of air pollution specialists from private industry and personnel of U.S. EPA.

During fiscal year 1976, two workshops to certify smoke opacity readers were conducted. A total of 23 technicians were present during the workshops; 19 were certified as Visible Emission Evaluators.

Other courses offered by the Manpower Office were:

<u>NAME OF COURSE</u>	<u>DATE</u>	<u>ATTENDANCE</u>
1 - Visible Emission Evaluation	Dec. 2-4, 1975	12
2 - Visible Emission Recertification	May 19-20, 1976	11
3 - Evaluation Techniques for Solid Waste Incinerators	August 20-27	19
4 - Meteorological Effects in the Air Pollution	Oct. 21-23, 1975	28
5 - Fourth Executive Environ- mental Conference	Nov. 11, 1975	125
6 - Air Pollution for Regional Planners (Sponsored by EPA)	May 13-14, 1975	36
7 - Analysis, sampling, and control techniques of atmospheric pollution in Puerto Rico	Oct. 7-20, 1975	2
8 - Environmental Affairs in Puerto Rico	Oct. 8, 1975	60

E. Career Potential

Substantial potential exists for future careers in air pollution control in Puerto Rico, but low salaries in the public sector employment tend to discourage persons from seeking these jobs. Better salaries in the private sector and in the continental U.S. have attracted qualified persons to these areas. Demand will continue for professionally trained personnel, especially engineers, but also chemists and other scientists. Potential will also exist for non-professionals trained as technicians, primarily for sampling and surveillance activities.

F. Conclusion

Puerto Rico's air quality program is the responsibility of the EQB, which is the only public agency in the Commonwealth with air pollution control functions. The program currently operates with a staff of 28 full-time persons and another 15 persons who share their time with the water quality program. There is currently a 20 percent vacancy rate in the program.

Only a modest increase in staffing can be expected over the next five years. Most of those hired will be professionals with degrees in engineering or the physical sciences. While the demand for trained personnel will continue in the public sector, most of these persons will likely seek employment with the private sector or in the continental U.S. because of the higher salaries.

II. NOISE

A. Introduction

Puerto Rico's regulation of noise pollution is covered under the Commonwealth's Environmental Policy Law and administered by the Environmental Quality Board (EQB). In addition to environmental noise, the Commonwealth also has an "unnecessary noise" law which is under the jurisdiction of the Department of Public Works. Other public agencies involved in noise include the San Juan Airport and the Puerto Rico Water Resources Authority (the Commonwealth's electric power supplies), both of which conduct studies on noise problems, and the Puerto Rico office of the Occupational Safety and Health Administration, which enforces the federal OSHA standards. The only municipality in the Commonwealth which has a noise ordinance is San Juan.

B. Workforce Profile

The information contained in this section was obtained primarily through on-site visits with program professionals working on Puerto Rico's noise control program.

There are currently three persons working in the Noise Bureau within EQB. As shown in Table IV, two of these persons are natural resources specialists, requiring a four year degree in a physical or natural science or in engineering. The technician is a noise inspector, a position not requiring college training. Additionally, the Bureau is authorized one engineer as program director; however, this position is currently vacant.

Program officials indicate that the present workforce level is not adequate to administer the program effectively, and that a total of 18 persons would be necessary for proper enforcement. Because of the workforce situation within the bureau, portions of the regulations have to be implemented by the police departments.

TABLE III

PUERTO RICO ENVIRONMENTAL QUALITY BOARD

Noise Program
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Natural Resources Specialist	2
Technician	1
TOTAL	3

C. Workforce Projections

Information for this section was based on the best professional judgements of officials working on the noise program.

The only projections for increased staffing that officials were able to provide is shown in Table V. These figures are based on the estimate that the vacant engineering position will be filled in 1977, bringing the program up to authorized strength, and on the indication given by program professionals that two additional people will be hired in 1979. It is projected that one will be an engineer and the other a natural resources specialist. Officials were unable to make projections beyond 1979, but indicated that turnover is expected to be negligible.

TABLE IV
 PUERTO RICO ENVIRONMENTAL QUALITY BOARD
 Noise Program
 Workforce Projections to 1982 (est.)

<u>Position</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>%/annum turnover (average)</u>	<u>%/annum growth (average)</u>
Engineer		1	1	2	2	2		20%
Natural Resources Specialist	2	2	2	3	3	3		10%
Technician	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>		N/A
TOTAL	3	4	4	6	6	6	N/A	17%

D. Training and Certification

The only training available to personnel of the Bureau of Noise is an informal on-the-job training program. This is due to the small number of persons in the program and the fact that there is almost no turnover. The Bureau does offer a three-day seminar on noise control to commonwealth and local officials and to local colleges. So far, more than 150 persons have attended these seminars. The Bureau also sponsors conferences and seminars in noise control for private groups and organizations and public agencies. Program officials indicate that the only educational program in noise is an audiology program at the University of Puerto Rico Medical School.

E. Career Potential

Program officials in the noise program anticipate a very limited career potential in this area over the next five years. Lack of adequate funding is the primary reason for this. Although there will

be few positions available, those that do exist will require professional training in engineering or the physical sciences with some background in acoustics being desirable.

F. Conclusion

The environmental noise program in Puerto Rico is the responsibility of EQB's Noise Bureau. Only three persons are currently working in the program and program professionals feel that this staffing level is inadequate for effective administration of the program. Little career opportunity is anticipated since only three more positions are forecast for the next five years.

III. PESTICIDES

A. Introduction

In the Commonwealth of Puerto Rico, the Department of Agriculture has been designated as the lead agency responsible for the administration of the pesticide applicator certification program. The Commonwealth's Certification Plan is administered by the Department's Analysis and Registration of Agricultural Materials Laboratory. The Puerto Rico Cooperative Extension Service has primary responsibility for the enforcement of the training and examination activities required under the Commonwealth's Certification Program. This Agricultural Extension Service prepares and distributes training materials, and prepares and conducts the training courses and examinations which are offered to the Commonwealth's pesticides applicators.

The necessary legal authority for the enforcement of the Commonwealth's Pesticide's Certification Plan is found in the Puerto Rico Pesticides Act of 1953. In conjunction with the U.S. Environmental Protection Agency, the Department of Agriculture has been attempting to implement this Act through the promulgation of extensive regulations. The Puerto Rico Pesticides Act includes requirements for local and yearly registrations, certifications, exemptions and experimental-use permits. The Act also authorizes the Department to inspect establishments which sell pesticides to insure that the products are properly registered. Products which have been formulated prior to the enactment of FIFRA can be used in Puerto Rico under provisional registration authority.

Puerto Rico's certification plan has been recently approved contingent to EPA approval of the Commonwealth's regulations which are required to implement the Commonwealth's Pesticide Act as amended. After EPA has

promulgated its restricted-use pesticides list, the Department's pesticide regulatory workforce is anticipated to expand dramatically. Commonwealth officials expect the Department to meet the October, 1977, FIFRA deadline. The Department has been experiencing difficulties in preparing educational training manuals to meet the requirements of the local agriculture. The Commonwealth's training program after the initial phases required by FIFRA is to be a continuous program to train applicators every four years so that they can retain active certification status.

B. Workforce Profile

The Department of Agriculture's Analysis and Registration of Agricultural Materials Laboratory is presently staffed with twelve persons who have pesticide regulatory responsibilities. Most have federally supported positions and members of the Laboratory staff also have fertilizer inspection responsibilities. The director of the Certification Program is a chemist who devotes approximately fifty percent of his/her time to the program. This official is responsible for the coordination of all actions relating to the Pesticide Act and its regulations. The director is assisted by an assistant chemist, two full-time pesticide chemists, four inspectors (agronomists), one CETA funded lab assistant and three secretaries. In addition it is estimated that the Assistant Secretary for the Commonwealth's Area of Special Services devotes about three percent of his time to the Certification Program. Also, one person has a position of Liaison Officer-Pesticides, under an EPA grant to devote full-time to the Certification Program.

The laboratory chemists perform all pesticide chemical analyses. Inspectors perform inspections, sampling, and investigations which are related to pesticide applicators, retailers, wholesalers, market places, importers and distributors. Inspectors have the responsibility of verifying compliance with provisions of applicable pesticide laws and regulations.

Within the Commonwealth Cooperative Extension Service, the Acting Assistant Director devotes about five percent of his time to the Certification Program. The Extension Service's Extension Pesticide Coordinator spends full-time administering applicator training and examinations under the Certification Program. This Extension Training Coordinator is assisted by seven coordinators who work full-time administering the applicator training program. In order to enforce the training and examination efforts of the Certification Program, the Cooperative Extension Service receives assistance from approximately 100 county agents.

It is estimated by program officials that approximately 1,000 commercial applicators and 25,000 private applicators will need to be certified so that Puerto Rico can be in full compliance with the requirements of FIFRA. Puerto Rico Department of Agriculture officials estimate that the Commonwealth has approximately 15,000 farmers.

According to the "Restricted Use Pesticide Applicator Certification Plan for the Commonwealth of Puerto Rico", all commercial applicators using and supervising the use of restricted use pesticides are certified by categories and subcategories, depending upon the occupation or type of activity performed by the applicator. The proposed categories under the Certification Plan are those listed in CFR (Code of Federal Regulations) 171.3 with the principal difference lying in redesignation of the

Agricultural Pest Control category. Under the Plant Pest Control category, further subcategories have been created which include the following:

1. Plant Pest Control
 - a. Pest Control in Sugarcane
 - b. Pest Control in Coffee
 - c. Pest Control in Fruits and Vegetables
 - d. Pest Control in Tobacco
 - e. Pest Control in Pastures, Forage Crops and Noncrop Agricultural Lands

The following depicts the estimated number of commercial applicators by category that are expected to be certified within the Commonwealth of Puerto Rico:

<u>Category</u>	<u>Number</u>
Plant Pest Control	110
Animal Pest Control	10
Forest Pest Control	5
Ornamental and Turf Pest Control	50
Seed Treatment	1
Aquatic Pest Control	5
Right-of Way Pest Control	126
Industrial, Institutional, Structural and Health Services Pest Control	180
Public Health Pest Control	76
Regulatory Pest Control	5
Demonstration and Research Pest Control	<u>400</u>
TOTAL	968

According to the Certification Plan, no category or subcategories have been established for the certification of private applicators of restricted use pesticides. Included in the estimate of 25,000 private applicators needing certification under the Plan are the following types of persons:

1. A farm owner applying or supervising the application of restricted use pesticides.
2. Supervisory personnel working for a private applicator or farm owner, having the function of applying or supervising the application of restricted use pesticides.

In sum, the total pesticide workforce in both the public and private sectors in the Commonwealth is composed of the following personnel who are depicted in the following table:

TABLE V

COMMONWEALTH OF PUERTO RICO

Current (1976-1977) Pesticide Workforce Staffing Levels
(est.) Public and Private Sectors

<u>Public Sector Position</u>	<u>1976</u>
Department of Agriculture	14
Cooperative Extension Service	8
County Agents	<u>100</u>
TOTAL	122
 <u>Private Sector Position</u>	
Commercial Applicators	968
Private Applicators	<u>25,000</u>
TOTAL	25,968

C. Workforce Projections

Information concerning workforce projections for the pesticides regulatory program of the Commonwealth of Puerto Rico was collected through on-site and telephone interviews with pesticide professionals in the Department of Agriculture. Several additional positions have been requested by the Department of Agriculture for the Certification Program. It is anticipated that the additional staff will be recruited in mid-1977. At the present time, the Department's Analysis and Registration of Agricultural Materials Laboratory has one vacant inspector position which is

expected to be filled. An additional inspector position has been requested for the Certification Program. One executive administrators officer and an additional laboratory assistant may be recruited by the end of calendar year 1977. It is anticipated that with the additional requested personnel on board, the Laboratory staffing level will increase to a total of sixteen. Further projections for years beyond 1977 were unobtainable, but it is generally thought by Department professionals that the total staff of sixteen staff members in the Laboratory's regulatory program would be adequate for the duration of the five-year period 1977-1981.

D. Training and Certification

Staff of the Department of Agriculture's Analysis and Registration of Agricultural Materials Laboratory receive primarily on-the-job training. It is generally felt by program officials that the Puerto Rico pesticide regulatory program is dependent on the federal government for training, enforcement, research on toxicity, and registration and certification procedures assistance.

Commercial applicators are to receive two examinations: one covering the general or core material and the other covering the specific requirements of the category or subcategory. Generally, the examinations are designed to be based on examples of problems and situations appropriate to the category and subcategory of operation and the following areas are included in the Program's General Standards:

- a. Pesticide Labeling Comprehension
- b. Safety in the Handling and the Use of Pesticides
- c. Potential Environmental Effects Resulting from the Use of Pesticides
- d. Pests
- e. Pesticides
- f. Equipment
- g. Application Techniques
- h. Commonwealth and Federal Laws and Regulations Applicable to Pesticides

Private applicators are required under the Plan to demonstrate practical knowledge about pest problems and pest control practices in agricultural operations. In addition, the private applicator applying for certification must demonstrate knowledge of aspects such as storage, use, handling and proper disposal of pesticides and their containers, and of his legal responsibility in connection with the use and handling of pesticides.

Training programs offered for private pesticide applicators are to include the following topics:

- a. comprehension of the labeling of pesticides
- b. safety in their use and application
- c. recognition of common pests and damages caused by them
- d. application techniques
- e. legislation and regulations applicable to the use of pesticides
- f. information about certification of applicators of restricted use pesticides and regulations

Certificates which are issued by the Commonwealth's Secretary of Agriculture for commercial and private applicators are to expire four years after the date of issuance and may be renewed for additional periods of up to four years. In order to renew the certificate, applicators are to satisfactorily attend a refresher course within one year prior to the expiration date of the certificate.

An Advisory Committee comprised of representatives of the Commonwealth Cooperative Extension Service and the lead agency periodically evaluates existing training and examination materials.

E. Career Potential

The Department of Agriculture's pesticide regulatory program has only recently become a large and significant effort. As the Analysis and Registration of Agricultural Materials Laboratory is the unit within the Department responsible for the enforcement of the Certification Plan, it has received the benefit of added personnel. It is clear that career potential within this Laboratory is currently and may become better for agronomists and chemists. The agronomists are designated to serve as inspectors for the enforcement of the Certification Plan.

F. Conclusion

The Analysis and Registration of Agricultural Materials Laboratory has dramatically expanded both its program and staffing recently as a result of the Federal Insecticide, Fungicide, and Rodenticide Act's (FIFRA) requirements. Prior to the implementation of the Certification Plan the Laboratory's pesticide staff has been registering pesticides, conducting dealer licensing for local agricultural pesticide products wholesalers, and performing chemical analyses of pesticides sold in the Commonwealth of Puerto Rico.

Enforcement of the Certification Plan is to be carried out by inspectors who will be assigned to conduct spot checks of commercial and private applicators to ensure that they comply with Commonwealth and Federal laws and regulations. Inspections are to be performed regularly and are to be followed up with reports of suspected violations.

IV. POTABLE WATER

A. Introduction

Puerto Rico's potable water program is the responsibility of the Commonwealth's Department of Health. There are no specific laws or regulations in Puerto Rico specifically relating to water supply. However, there is a law on the books known as Law 81, which the Secretary of Health may use to adopt regulations covering water supply. The program currently consists of the implementation of the federal potable water program, but the Commonwealth cannot obtain primacy under the Safe Drinking Water Act (SDWA) until several activities are brought into compliance with federal laws and until Commonwealth regulations are enacted.

The program consists of several activities performed by the Health Department, which include an evaluation of the current program and the setting of priorities for future activities. The Department also performs inspections of filtration plants and rural aqueducts. The Health Department operates a laboratory which has the capability for inorganic, organic, microbiological, and turbidity analyses. Radiological analysis is available from the University of Puerto Rico School of Medicine. The Department also inspects and certifies chemical and biological laboratories. Currently there is no enforcement program or emergency plan.

The Puerto Rico Aqueduct and Sewer Authority (PRASA) has responsibility for the construction, operation, and maintenance of the Commonwealth's public water treatment facilities. All such

facilities are owned and operated by PRASA - there are no locally or municipally owned facilities.

B. Workforce Profile

Information for this section was obtained primarily through on-site interviews with professionals working with the potable water program and through various materials and documents provided by them.

The Health Department currently has seven persons working full time in the water supply program as illustrated in Table V. The engineer is a chemical engineer by training. The four environmental health officers are professionals with college degrees in environmental health. The two persons classified as technicians are inspectors who work in the laboratory. Both have high school educations and one has some college work. In addition to these persons, there are another 50 inspectors in the Health Department who devote approximately 30 percent of their time to the potable water program.

Workforce in the program sharply increased with the enactment of SDWA. Prior to that time, there were only two persons in the program. Program officials indicated that turnover among personnel is negligible.

TABLE VI
 PUERTO RICO HEALTH DEPARTMENT
 Potable Water Program
 Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Engineer	1
Environmental Health Officer	4
Lab Technician	<u>2</u>
TOTAL	7

As mentioned previously, PRASA has responsibilities in the potable water program for the construction, operation, and maintenance of public water treatment facilities. Program officials indicate that there are 49 public water treatment plants in Puerto Rico. No operator certification program currently exists, although it is anticipated by program professionals that one will be started in the next few years. Officials were unable to provide staffing information for treatment plant operations personnel, but indicated that there are currently more than 4,000 people working in PRASA.

C. Workforce Projections

The information contained in this section is based on the best professional estimates of officials working with the program and on materials and documents supplied by them.

Substantial growth in the water supply program is anticipated in the next two years as the Health Department expands its activities to bring the program into compliance with federal standards and reaches the point where it can assume primacy under SDWA.

The five year plan concerning the Department's activities includes the following goals:

- expansion of surveillance activities to cover all public water supplies;
- certification of all water supply laboratories;
- training of personnel performing turbidity and chlorine residual determinations;
- enactment of a program for issuance of variances and exemptions;
- development of a plans review program with PRASA and private industry; and,
- development of an emergency plan.

To carry out these activities, program officials have estimated the need for several additional persons. As shown in Table VI, it is expected that most of these persons will be hired in the next two years. Projections beyond that point were impossible to determine. The additional engineer will be utilized in the plans review program and the chemist, bacteriologist, and secretary are necessary to increase laboratory capabilities and for the lab certification program. Seven additional Environmental Health Officers will be hired, probably in 1978, to handle program activities in each of Puerto Rico's seven regions. Program officials anticipate the continued use of the 50 inspectors mentioned in the previous section for part time activity in the water supply program.

TABLE VII
 PUERTO RICO HEALTH DEPARTMENT
 Potable Water Program
 Workforce Projections to 1982 (est.)

<u>Position</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>%/annum turnover (average)</u>	<u>%/annum growth (average)</u>
Engineer	1	2	2	2	2	2		20%
Chemist		1	1	1	1	1		N/A
Environmental Health Officer	4	4	11	11	11	11		35%
Bacteriologist		1	1	1	1	1		N/A
Lab Technician	2	2	2	2	2	2		N/A
Other		1	1	1	1	1		N/A
TOTAL	7	11	18	18	18	18	N/A	24%

PRASA officials indicate that little, if any, growth is anticipated in the number of water supply plant operators over the next five years. Current turnover among treatment plant operators is said to be less than two percent per year. The reasons for low turnover are that the operators are unionized and receive good salaries and that there is little opportunity for operators in Puerto Rico other than with PRASA. Specific workforce needs for operating personnel were not available.

D. Training and Certification

Training of potable water personnel is a function of both the Department of Health and PRASA. Employees of both agencies attend EPA training courses and participate in courses offered by local universities. PRASA gives full paid leave to employees attending these courses.

The Health Department has a training program for new in-house personnel as well as a program in samples collection for local health employees. Training programs for field and laboratory personnel are currently in the process of being developed. Additionally, EPA's Region II office provides formal on-the-job training to Health Department personnel working in the water program.

At PRASA, the training provided is limited to on-the-job training for agency personnel and formal OJT for treatment plant operators at the individual plant. Program officials indicate that over 60 percent of the operators have received such training. Presently, the Puerto Rico Department of Education has an application pending with EPA for the development of an operator training program through the Commonwealth's vocational-education system. If this is approved, officials anticipate that the program may be implemented as early as fall of 1977. No operator certification program currently exists, but professionals suggest that once certification is required, expanded training programs, such as the one being developed by the Education Department, will be necessary.

EPA's Office of Water Supply has developed a comprehensive training program to support the implementation of SDWA. The first series of courses, designed to provide the skills and knowledge required of regional, state, and operations personnel in carrying out responsibilities under SDWA, is expected to be available in mid-1977. Some of the courses which may affect Puerto Rico's program include the following:

- Safe Drinking Water Act implementation workshops and materials for local operators and officials.
- Basic operator training course for entry-level water supply personnel designed for delivery by state educational institutions and agencies.
- Laboratory certification courses for regional and state personnel involved in certifying chemical and bacteriological laboratories.
- Laboratory methodology courses in approved testing methods for regional, state, and local laboratory technicians.
- Sanitary survey courses in the methodology involved in surveying small water systems as well as more complex systems.
- Public notification short course for local suppliers to aid in handling public notification procedures.
- Variances and exemptions course for state personnel to determine procedures involved in such instances under SDWA.
- State training program management course for regional and state agency personnel in training planning.

E. Career Potential

There appears to be significant career potential in the potable water program in Puerto Rico. The program is relatively new and owes much of its current workforce to the passage of SDWA. The Commonwealth hopes to assume primacy for the program and is initiating an ambitious effort to build the water supply program to bring it into compliance with federal standards to the point where primacy can be attained. Program officials indicate that the staffing may increase by two and one half times its present number in the next two years. Opportunities appear greatest for professionals with scientific backgrounds. There will be specific needs for persons trained in

environmental health, chemistry, and bacteriology. It is also anticipated that a small increase in operators may be required once a certification program is established.

F. Conclusion

The water supply program in Puerto Rico is administered by both the Department of Health and PRASA and is concerned with the implementation of the Safe Drinking Water Act. The Health Department has the overall planning, surveillance, analysis, and enforcement responsibilities whereas PRASA owns, builds, operates, and maintains the public water treatment facilities. The Health Department's staffing increased from two people to the current seven with the passage of SDWA. Efforts by the Department to gain primacy under the Act are expected to further increase the staffing by two and a half times over the next two years. PRASA's workforce in the potable water program is expected to remain stable with little, if any, increase. The Commonwealth anticipates the establishment of an operator certification program which may affect future needs for treatment plant operators.

V. RADIATION

A. Introduction

Puerto Rico's radiation control activities are located in the Radiological Health Program of the Commonwealth's Department of Health. The program was initiated in the mid-1960's and is primarily supported with financial and technical assistance provided by three federal agencies: the Environmental Protection Agency, the Nuclear Regulatory Commission, and the Food and Drug Administration.

Program activities are classified into four categories: 1) X-ray survey and control, 2) radioactive materials, 3) non-ionizing radiation, and 4) planning and administration. The X-ray survey and control function is the largest and is concerned with the registration and inspection of X-ray machines to ensure compliance with State Regulations. Another current activity within the program is the preparation of a radiological emergency response plan. Puerto Rico does not have any programs regulating natural radiation nor does it maintain data on occupational exposures.

B. Workforce Profile

There are currently ten full-time and two part-time persons in the Radiological Health Program. The full-time personnel are shown in Table VIII and are classified into four occupational categories. The part-time personnel include an administrator with responsibilities for other Health Department programs as well as radiation and a program support person whose activities are primarily with other Health Department programs.

TABLE VIII

PUERTO RICO DEPARTMENT OF PUBLIC HEALTH

Radiological Health Program
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Director	1
Specialist	5
Technician	1
Support Personnel	<u>3</u>
TOTAL	10

The Health Department has established requirements for each of the job categories shown. The health director is required to have, as a minimum, a bachelor's degree in engineering or the physical or biological sciences. The current director is a medical doctor. The radiological health specialist position requires a bachelor's or graduate degree in engineering, biological or physical sciences. Experience can be substituted for the college degree; however, most of those without degrees have had some college training or technical courses. Technicians must have at least a high school education with some college or technical training considered desirable. Support personnel are professional or technical persons from other Health Department programs who are engaged in radiological activities.

C. Workforce Projections

No projections regarding the growth/decline of personnel in the Radiological Health Program were available. The program has experienced funding difficulties over the past few years and currently receives

about 50 percent of its support from the federal government. The salaries of program personnel compare unfavorably with similar positions in the continental United States.

D. Training and Certification

For the most part, training available to radiation program personnel is provided by the federal government. Personnel have attended an interagency course in emergency response planning offered by both EPA and NRC, and a course in X-ray compliance procedures sponsored by FDA. The only training provided within the Health Department is an informal on-the-job program.

E. Career Potential

It is not possible to anticipate the potential for careers in radiation protection in Puerto Rico. The primary reason for this is the difficulty experienced by the Commonwealth in funding the program. Whatever future jobs do exist will probably require professionals with degrees in engineering or the biological or physical sciences. There may also be some opportunity for technicians with a high school education.

F. Conclusion

Puerto Rico's radiation program is the responsibility of the Commonwealth's Health Department. Currently, the program is staffed by ten full-time and two part-time persons, most of whom are

professionals with bachelor's or advanced degrees. Determinations of future program growth or career potential cannot be made because of the unpredictable effects of financial constraints on the program.

VI. SOLID WASTE

A. Introduction

The basis for Puerto Rico's solid waste program is the Comprehensive Solid Waste Management Plan for Puerto Rico, enacted in 1971. This plan recommended the consolidation of all laws relating to solid waste into one law meeting present and future needs, the creation of a Solid Waste Management Authority, and the upgrading of solid waste collection services which are a function of municipal governments.

Implementation of the solid waste program is the responsibility of the Commonwealth's Environmental Quality Board (EQB). The Board has a Bureau of Solid Waste which is under the direction of the Associate Director for Noise and Solid Waste. In the administration of the program, the activities of the Bureau generally include the following:

- Hazardous and toxic wastes planning. The Bureau is developing a state plan for the disposal of hazardous and toxic wastes and has identified present disposal sites, surveyed the types and amounts of toxic wastes produced, and evaluated the impact of such disposal on the environment.
- Resource recovery. The Bureau is formulating a long-range implementation plan for the development of resource recovery systems. No resource recovery facilities currently are in existence in the Commonwealth. Work has been done on the investigation of existing and potential markets for recycled materials and the study of various resource recovery processes.
- Enforcement. The Bureau continually inspects municipal solid waste operations to ensure compliance with regulations.

B. Workforce Profile

Information contained in this section was obtained primarily through on-site interviews with professionals working in the solid waste program.

The Bureau of Solid Waste has a current staffing level of 15 persons. These persons can be classified into five occupational categories as illustrated in Table IX. The engineers, sanitarians, and biologists are professionals with four year degrees or advanced degrees. The two engineers are mechanical and civil engineers by training. The biologists have degrees in biology and the five sanitarians have masters degrees in sanitary science. The technician is an environmental technician and has an A.A. degree. The five persons classified as "other" include four secretaries and one draftsman. In addition, the program has two vacancies for professionals with degrees in sanitary science or environmental health.

The primary method of solid waste disposal in Puerto Rico is the landfill. Program officials indicated that there are 38 licensed landfills in the Commonwealth. The landfills are municipally owned and operated. Officials of the Solid Waste Bureau estimate that there are approximately 150 persons working in landfill operations. This is based on the estimate that there are at least three persons at each landfill, with several having as many as five or six. The only large landfill in the Commonwealth is in San Juan and employs fifteen people.

TABLE IX
COMMONWEALTH OF PUERTO RICO
Public Sector Solid Waste
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Engineer	2
Sanitarian	5
Biologist	2
Technician	1
Other	5
TOTAL	15

C. Workforce Projections

The data contained in this section were obtained through on-site interviews with program professionals and are based on the best professional judgements of these persons.

Program officials within the Bureau of Solid Waste anticipate that the workforce will be doubled by 1978. They indicate that further program expansion will be consistent with EPA's solid waste program and with the recently enacted Resource Conservation and Recovery Act and Toxic Substances Control Act. The two areas which will be receiving increased emphasis within the next few years are hazardous and toxic wastes and resource recovery. Both these activities will require the addition of personnel to the program.

As shown in Table VIII, the largest increase can be expected to occur in 1978. Following this, program professionals estimate that several more people will be added in 1979, and at this point the

workforce will stabilize with little, if any, future growth foreseen during the five year period. Officials also indicate that they expect the requirements for personnel to remain substantially the same. The majority of those hired will continue to be engineers and sanitarians.

Program officials do not regard personnel turnover in the program to be a significant problem. Only two persons have left in the last five years. Workforce projections for landfill operations personnel were not available.

TABLE X

COMMONWEALTH OF PUERTO RICO

Public Sector Solid Waste
Workforce Projections to 1982 (est.)

<u>Position</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>%/annum turnover (average)</u>	<u>%/annum growth (average)</u>
Engineer	2	3	6	8	8	8		37%
Sanitarian	5	7	10	12	12	12		21%
Biologist	2	2	3	4	4	4		17%
Technician	1	1	3	4	4	4		47%
Other	<u>5</u>	<u>5</u>	<u>7</u>	<u>8</u>	<u>8</u>	<u>8</u>		11%
TOTAL	15	18	29	36	36	36	N/A	21%

D. Training and Certification

The Bureau of Solid Waste conducts training for its own personnel and provides training programs for local public works directors in Puerto Rico. In-house training consists of an on-the-job program for Bureau employees and refresher courses in solid waste management. The Bureau also coordinates landfill operator training through the vocational education system conducted by experienced landfill operators.

Program officials indicate that a good training program for personnel needs to be developed. Specifically mentioned was the need for a program in hazardous and toxic wastes management. The Bureau took advantage of EPA sponsored training at the national training center in Cincinnati, but has been unable to find an acceptable substitute since the discontinuation of the EPA training.

Professionals also expressed a need for upgrade training for personnel in the areas of new techniques in sanitary landfilling and solid waste processing technology.

E. Career Potential

The potential for future careers in solid waste management in Puerto Rico appears to be significant at this time. Program officials estimate that workforce levels should double by 1978 and then further increase in 1979, to reach an adequate level for effective program administration. This large increase in personnel can be attributed to two factors: the Toxic Substances Control Act and the development by the Bureau of a hazardous and toxic wastes plan, and the Resource Conservation and Recovery Act and the Bureau's anticipated involvement in the development of resource recovery facilities in the Commonwealth.

Although opportunities can be expected to exist for both professional and technical personnel, the greatest potential will be for those persons with four-year or advanced degrees, especially in engineering and the physical sciences. Positions will be

available in such areas as hazardous waste planning and resource recovery planning, design, and operation.

F. Conclusion

Puerto Rico's solid waste program is administered by the Bureau of Solid Waste within the Environmental Quality Board. Current program activities include hazardous waste planning, development of resource recovery programs, and inspection of municipal solid waste operations. The program is staffed with fifteen persons, primarily professionals, with educational training in engineering and physical sciences. Officials expect the workforce level to double within the next two years, mainly because of increased activities in hazardous wastes and resource recovery. Career opportunities will continue to be greatest for persons with professional training in engineering and the sciences.

VII. WASTEWATER

A. Introduction

Primary responsibility for the wastewater program in Puerto Rico rests with the Water Quality Bureau and Water Resources Management Bureau under the direction of the Associate Director for Air and Water of the Environmental Quality Board (EQB). Created in 1970, the EQB is responsible for the implementation of the Federal Water Pollution Control Act Amendments (FWPCA), as well as Puerto Rico's water quality regulations.

Although EQB is responsible for water quality management activities, another agency, the Puerto Rico Aqueduct and Sewer Authority (PRASA), has responsibility for the construction, operation, and maintenance of all public wastewater facilities. Together, these two agencies comprise the Commonwealth's entire public wastewater program. There are no municipally owned or operated waste treatment facilities on the island.

EQB carries out the water quality program through the performance of several functions. They are described in EQB's Water Quality Control Program Progress Report for fiscal year 1976 and include the following:

Municipal Wastewater Treatment Plant Construction

Municipal facilities for the collection, treatment and disposal of wastewater are planned by EQB with the assistance of PRASA, and other Commonwealth and Federal agencies. Their construction, operation and maintenance is responsibility of PRASA. EQB, with the pertinent intervention of EPA, provides supervision of all these activities. The Board, as the State Water Pollution Control Agency, reviews and approves the plans and specifications submitted by PRASA under Sec. 201 of FWPCA.

Municipal facilities are constructed according to a priority system and project list prepared by EQB after adequate public participation and contribution from several Commonwealth and Federal agencies is obtained. Specific treatment facilities planning (201 Planning) is conducted by PRASA, based on the aforementioned priority system and pertinent regulations.

EQB also reviews and approves plans and specifications of "private" sewage treatment facilities. These projects are constructed and operated by private firms in relation to residential and commercial establishments for which no municipal facilities are available.

Operation authorizations are also issued by EQB in relation to this task. Ninety-one plans and specifications were reviewed and approved during FY 1976 under this permitting phase.

Municipal Wastewater Treatment Plant Operation and Maintenance

In conjunction with the MWWTP facilities element, EQB conducts inspections of said facilities to supervise its operation. Inspection results are referred to EPA for proper action with copies to PRASA. A total of 263 MWWT plant inspections were conducted during FY 1976, 210 municipal and 53 private.

Point Source Permits

The EQB is participating in the administration of the NPDES permit program together with the EPA. The goal is to obtain delegation of the program as soon as adequate capability is developed. Moving toward this goal, great efforts have been made to improve personnel qualifications and to increase manpower. Nevertheless, delegation request is not expected until late FY 1977 or early FY 1978.

The core of EQB's activities in the NPDES permit program is in relation to the issuance of Water Quality Certificates (WQC) under Section 401 of FWPCA. These are issued for permits developed by EPA, the Army Corps of Engineers, and EQB.

There are other duties being performed by the EQB related to the NPDES permit program. They modify major municipal and non-municipal permit conditions; insure that construction of treatment facilities by major industrial dischargers meets and WQS; verify compliance of major municipal permits with BPCT construction schedules; and insure compliance by major municipal and industrial facilities with effluent conditions. They review discharge monitoring reports and compliance schedule reports, and have conducted many special site visits for other than NPDES enforcement purpose.

They investigate non-filers and provide to them the appropriate NPDES applications. In conjunction with this task, the

Program has given orientation to both industrial and municipal dischargers, and to the public in general in relation to the NPDES.

It is pertinent here to indicate that in addition to EQB's activities under the NPDES permit program, other permits are issued based on Commonwealth laws. EQB revises and approves constructions of "private" domestic and industrial sewage treatment plants. Authorizations to construct, and later authorizations to operate, are issued under the provisions of organic Law #9 for projects which will develop into dischargers. These include industrial, commercial, agricultural and other types of control activities. Currently this represents about 40 percent of the EQB's efforts on permits. This activity is considered of significance since the NPDES at present does not cover new sources of all kinds, plus it provides continuity to the NPDES permit program and eases the implementation of EQB's and EPA's rules and regulations. Upon delegation of the NPDES to the Commonwealth, the local permit system will be phased into the national program. This system also provides for the approval of location of STP's and other treatment facilities.

Water Quality Management Planning

During FY 1976 a substantial effort was devoted to the preparation of the 303 (e) basin plans for the 13 water quality management regions of Puerto Rico. These plans are intended to manage and control pollution on a basin-wide scale. Specifically, each plan will provide for orderly water quality management by identifying problems and outlining to the extent available, abatement actions and planning requirements that will eventually alleviate these problems.

Also, during this fiscal year resources were used in advising the Laboratory and Sampling Bureau in the planning of the intensive surface water monitoring surveys. The primary function of these surveys has been to update the existing water quality situation referred to in the various 303 (e) plans.

Other activities in Water Quality Management Planning include a priority system and listing for municipal sewage treatment plant construction, review of Section 201 grant applications, reclamation planning, revision of the Commonwealth's Water Quality Standards (WQS), and the development and revision of Section 208 plans. There are currently two 208 agencies in Puerto Rico. The statewide agency includes the entire island and the North Metropolitan areawide agency includes seven municipalities including San Juan.

Monitoring

The Program conducts several types of monitoring activities: Intensive Water Quality Surveys (IWQS), the Permanent Water Quality Monitoring Network (PWQMN), and the Effluent Surveys (ES). The first two cover ambient water quality aspects and the latter is related to compliance monitoring. The IWQS are conducted upon request of the water quality planning group for the purpose of developing water quality management plans, priority systems and water quality appraisal reports.

The monitoring network comprises streams and coastal waters stations which are sampled every two months. This network was designed to provide information as to water quality trends of the different bodies of water through the Commonwealth. The parameters determined in this monitoring activity are in accordance with those stated in the Regulations of Water Quality Standards of the EQB, which were developed using EPA criteria. The stream monitoring is being conducted by U.S. Geological Survey (USGS) under written agreement with EQB and the EQB takes care of the coastal stations.

Activities also include municipal and industrial effluent surveys.

Enforcement

Enforcement actions are initiated in two ways, the permitting system being one of them. Once it is discovered (by document evaluation and revision or complaints received) that an existing source does not have an effective EQB or EPA (NPDES) permit or has not applied for it, necessary enforcement action is initiated. The same applies to a source that is being constructed or established without an EQB permit, whichever is applicable. In the case of an EPA (NPDES) permit, the violation is reported to EPA. Most of these cases are solved when the discharger submits the pertinent permit application. Only in cases where the source is reluctant to submit the application, formal legal action is pursued.

The other way through which enforcement action is initiated is when a violation to an issued permit (other EQB's and NPDES) is acknowledged through routine inspection or a complaint.

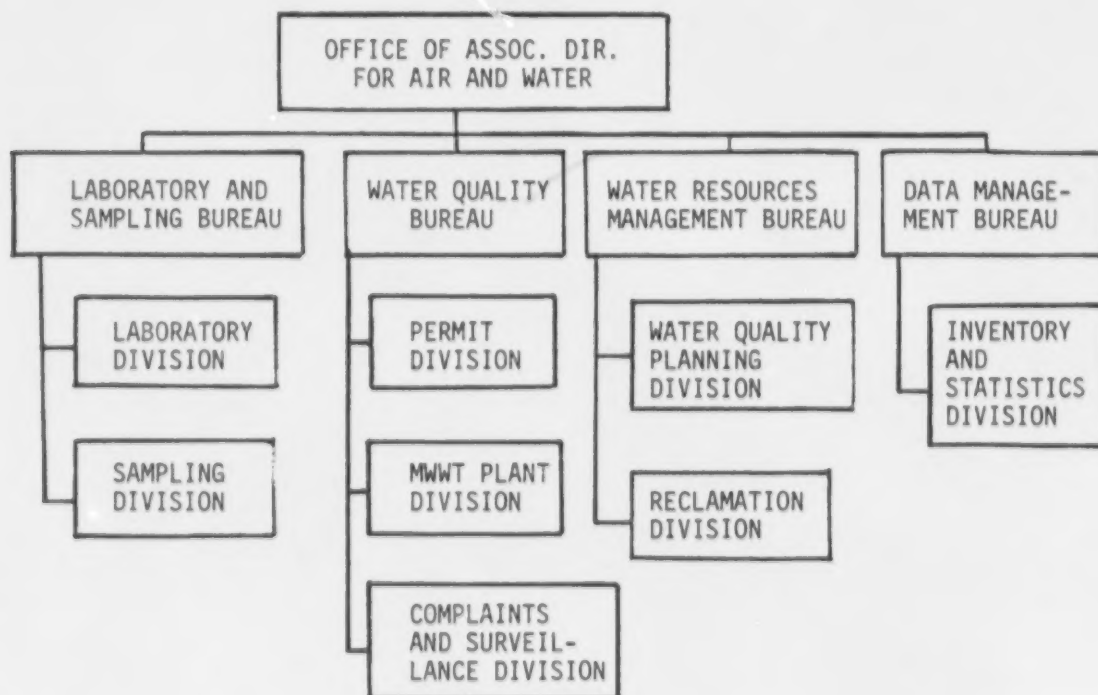
B. Workforce Profile

The information contained in this section was provided primarily through on-site interviews with professionals working in the wastewater program and through the use of materials and documents supplied by them.

As previously indicated, EWQB contains two bureaus devoted to the wastewater program, the Water Quality Bureau and the Water Resources Management Bureau. The program is further divided into Divisions within each Bureau as illustrated in Figure 4. In addition, two other bureaus, the Laboratory and Sampling Bureau and the Data Management Bureau, provide support to the water program, as well as the air program.

Figure 4

COMMONWEALTH OF PUERTO RICO ENVIRONMENTAL QUALITY BOARD



The staffing of the water quality program in EQB consists of a total of 87 people. Of these, 71 work solely on the water program while the other 16 divide their time between the water and air programs. It is estimated that they spend approximately 50 percent of their time on the water program. The staffing profile in Table XI illustrates only those persons working full time on the water programs.

The workforce is divided into six occupational categories, with that of engineer being the largest. These are professional positions requiring a four-year degree in an accredited engineering program. The chemist and natural resources specialist positions are also professional, requiring college degrees. The natural resources specialist usually has a degree in a physical or natural science or in engineering. The technician and lab technician positions require a minimum of a high school education. Different levels of technician require further education or work experience, or both. Those classified as "other" include nine secretaries, a technical writer, and a draftsman.

The 16 persons with part time responsibility in the water program include three engineers, three natural resources specialists, and ten "others" which include five secretaries, three statisticians, an administrative officer, and a manpower and training officer.

TABLE XI

PUERTO RICO WATER QUALITY BUREAU AND
WATER RESOURCE MANAGEMENT BUREAU

Wastewater Program
Current (1976) Staffing Level

<u>Position</u>	<u>1976</u>
Engineer	18
Chemist	14
Natural Resources Specialist	8
Lab Technician	12
Technician	8
Other	11
TOTAL	71

Program officials indicate that the program has an unusually high vacancy rate, ranging between 30 and 40 percent. The primary reason given for this is the low salaries paid by EQB. Qualified persons, particularly engineers, are able to obtain better salaries with private industry or with PRASA, the other public water quality agency. Those recruited are normally just out of school and after gaining two or three years of experience, they tend to move on to better paying jobs elsewhere. This also accounts for a turnover rate of about 15 percent per year in the program.

As mentioned in the Introduction, PRASA is responsible for the construction, operation, and maintenance of public wastewater treatment plants in Puerto Rico. PRASA is divided into four Operational Areas for the administration of its activities and these include the Areas of Operation, Engineering, Administration, and Commercial Relations. Program officials indicate that there are 100 public sewage treatment plants in Puerto Rico and five or

six industries which have their own treatment facilities. No operator certification program currently exists, although it is anticipated that one will be started in the next few years. Officials were unable to provide staffing information for treatment plant operations personnel but indicate that there are over 4,000 people currently working in PRASA.

C. Workforce Projections

The data obtained for this section were collected from on-site interviews with program professionals, representing their best judgements, and through the use of materials and documents supplied by them.

Workforce growth within the water quality program in EQB is estimated to be small although increased activity in each of the program functions is anticipated by program officials. An overall growth rate of about five percent per year was seen as realistic with the greatest demand continuing to be for engineers. The turnover and vacancy problems discussed in the previous section are not expected to change significantly over the next few years. However, the program managers are considering the use of funds for increasing salaries rather than for creating new positions. It is hoped that this may serve to attract and keep qualified personnel. It is estimated that all job categories will increase at about the same level, as shown in the following table.

TABLE XII

PUERTO RICO WATER QUALITY BUREAU AND
WATER RESOURCE MANAGEMENT BUREAU

Wastewater Program
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	18	19	20	21	22	23		5%
Chemist	14	14	15	16	17	18		3%
Natural Resources Specialist	8	9	10	10	11	12		9%
Lab Technician	12	12	13	14	15	16		6%
Technician	8	9	9	10	10	11		7%
Other	11	11	11	11	11	11		N/A
TOTAL	71	74	78	82	86	91	15%	5%

Officials at PRASA indicate that virtually no growth is expected among treatment plant operations personnel in the next five years. The only increased activity anticipated is the construction and operation of ten regional treatment plants. This will require some additional personnel, but officials feel the increase will be very small. Further breakdown of workforce needs were not available. Program professionals also estimate operator turnover to be less than two percent per year. Reasons for this are that operators are unionized and receive good salaries and that there is little opportunity for operators in Puerto Rico other than with PRASA.

D. Training and Certification

Training for wastewater personnel is the responsibility of both EQB and PRASA for personnel of their respective agencies. In EQB, informal on-the-job training is provided to new employees. In addition, a manpower and training officer position was created in 1975 for both air and water programs with equal time spent in each program. The officer is responsible for conducting seminars, workshops, and conferences, and sending personnel to out-of-state training courses. The program was developed with the assistance of U.S. EPA and with local industries. EQB has sent personnel to EPA courses in Cincinnati and New York City and offered the following courses locally in FY 1976.

<u>TITLE</u>	<u>DATE</u>	<u>ATTENDANCE</u>
1) Evaluation Performance of Waste Water Treatment Plants	March 1975	37
2) Workshop on NPDES Compliance Monitoring	October 1975	27
3) Construction Grants Procedures	December 1975	3
4) Evaluation of UNOX SYSTEM (Sponsored by Union Carbide)	January 1976	4
5) Sludge Disposal Procedures Seminar (Sponsored by Dorr-Oliver)	March 1976	6
6) Design and Evaluation of Waste Water Treatment Plants	April 1976	11

Other courses planned by the EQB include the following:

<u>ACTIVITY</u>	<u>TO BE OFFERED TO</u>
<u>Course:</u> Development Regional 201 Facilities Planning; I/I studies EIS, feasibility studies, Oceanographic Studies, etc.	EQB Personnel
<u>Course:</u> Design of activated sludge and trickling filtration treatment systems	EQB Personnel
<u>Course:</u> Design for Physic-Chemical treatment and Advance wastewater treatment systems	EQB Personnel

Within PRASA, training is limited to on-the-job training for agency personnel and formal OJT for treatment plant operators at the individual plant. Program officials indicated that over 60 percent of the operators have received this training. No certification program currently exists, but professionals anticipate an expanded training program once certification is required.

E. Career Potential

The projection of future careers in the wastewater program in Puerto Rico is limited due to the small growth anticipated in the program. Within EQB, jobs exist because of extremely high turnover and vacancy rates. Because of low salaries, qualified persons generally find better paying jobs elsewhere, such as PRASA or with private industry. The need in EQB is particularly acute for engineers. The situation may change if a plan to increase salaries instead of creating new jobs is implemented.

Fewer positions are anticipated to be available in PRASA. Program officials have forecast almost no growth in terms of workforce. The construction of ten regional sewage treatment

plants and an anticipated operator certification program should provide some additional career potential at the operator level.

F. Conclusion

Puerto Rico's wastewater program is the responsibility of both EQB and PRASA, which are the only public agencies in the Commonwealth having such responsibilities. EQB has the functions of water quality management, planning, and enforcement, whereas PRASA owns, builds, operates, and maintains public wastewater treatment plants.

EQB has a workforce of 87 persons in the program, 71 who work solely on water quality. PRASA has a workforce of 4,000 in a variety of activities. Little growth in personnel is forecasted for either agency, due to salary constraints within EQB and slight expansion in activities and low turnover within PRASA. Future opportunities will tend to be best for engineers and treatment plant operators.

VIII. ENERGY

Energy matters in Puerto Rico are dealt with by three Commonwealth agencies: the Department of Consumer Affairs, the Office of Petroleum Fuels Affairs, and the Puerto Rico Water Resources Authority (PRWRA), which is the island's electric power utility. Federal officials have indicated that there is little overall coordination among the agencies. The Federal Energy Administration (FEA) considers the Department of Consumer Affairs to be the lead agency, as designated by the Commonwealth's governor. The Department of Consumer Affairs has designated an Energy Group to promote energy conservation planning and has submitted a proposed energy conservation plan for the Commonwealth to FEA.

Until the late 1940s, Puerto Rico's energy came primarily from domestic hydroelectric plants and imported fuels. This situation has changed drastically with the development of the petroleum refining industry; today most energy is provided by this source. Although the Commonwealth is still largely dependent on imported fuel, it now also exports considerable amounts of energy.

Following the energy crisis in 1973, the Commonwealth developed a program to conserve energy within government institutions and to promote energy conservation by the general public. Goals established were the reduction of energy consumption by the government by seven percent and in the private sector by five percent. These goals were not achieved. According to program

officials, this was partially due to the absence of a comprehensive energy plan. As a result, the proposed energy conservation plan is perceived as a necessary first step toward attainment of a comprehensive strategy.

The energy plan contains five mandatory elements required by FEA and two additional elements which meet the particular needs of Puerto Rico. They include:

- 1) Revision and analysis of illumination standards
- 2) Review and analysis of thermal standards (air conditioning)
- 3) Energy efficiency in government procurement practices
- 4) Promotion of van-pool projects
- 5) Traffic engineering modifications
- 6) Development of solar water heaters
- 7) Educational campaign

The last two elements are the ones designed for Puerto Rico's needs. Solar energy is particularly attractive because of the climate in the Commonwealth. This, combined with the fact that the government constructs approximately 40 percent of all new housing in Puerto Rico, makes solar energy use feasible. The government plans a massive use of solar devices in new construction.

The educational program was designed to influence the public attitude and induce people to adopt energy conservation practices. A three-pronged approach is planned. A practical education program in which individuals will be taught energy conservation

procedures relating to their own jobs and lives is a basic component. The Commonwealth views this as a kind of Extension Service for Energy in which demonstration projects will also be developed. The second part of the education program is a media campaign to promote the theme of energy conservation. The third component of the program stresses interaction and cooperation with private industry to achieve conservation goals within the private sector.

Selected Post Secondary Institutions
With Formal Environmental Energy Programs

The University of Puerto Rico, Rio Piedras Campus, offers a Bachelor of Science degree program in Environmental Management. The program is administered through the Natural Science Department, and as a consequence, the curriculum has a strong emphasis on natural sciences. No information is presently available on student enrollment and faculty support. The University of Puerto Rico, Mayaguez Campus offers a program in Engineering and Agricultural Sciences. Certain individual courses integrate environmental concepts.

The University of Puerto Rico is a commonwealth funded, public institution. The University has four campuses: Rio Piedras, Mayaguez, Cayey, and Humacao. During academic year 1976-77, the total enrollment for the University of Puerto Rico was 51,061.

The Inter American University of Puerto Rico, a non-profit, private institution, has an extensive educational campus network. Courses are available at nine campuses: Hato Rey, Arecibo, Barraquitas, Bayamon, San German, Aguadilla, Fajardo, Guayama, and Ponce. Information was not obtained on environmental curricula/courses offered through these campuses. All campuses have a less than four-year program.

Puerto Rico has a commonwealth sponsored regional college program which is similar to the community college system in many states. Campuses of the regional college system are located in Aguadilla, Arecibo, Bayamon, Carolina, and Ponce. Information is lacking on the availability of environmental programs offered through these institutions.

State Legislation

PUERTO RICO GENERAL

TITLE:

Organic Act of the Department of Natural Resources
Puerto Rico Laws

PURPOSE:

To coordinate environmental protection and conservation programs, and to create a department of natural resources.

DEFINITIONS:

ADMINISTERING AUTHORITY:

Department of Natural Resources
Board of Environmental Quality

AUTHORIZATIONS:

To make recommendations relating to environmental policy;
To issue regulations pursuant to the act;
To enter into agreements to carry out the act;
To supervise conservation of coastal and marine areas;
To assume certain functions of the Mining Commission, the Public Works Commission, the Public Service Commission, and the Department of Agriculture.

PROHIBITED ACTS:

To violate any regulations issued under the act.

PENALTIES:

Violation constitutes a misdemeanor.

PUERTO RICO AIR

TITLE:

Law on the Control of Air Pollution
Puerto Rico Laws

PURPOSE:

To establish a program to conserve air quality in order to
protect human health and safety.

DEFINITIONS:

- | | |
|------------------------|--------------|
| 1. Air pollutant | 4. Emission |
| 2. Air pollution | 5. Person |
| 3. Source of pollution | 6. Secretary |

ADMINISTERING AUTHORITY:

Department of Health
Advisory Council

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To develop an air pollution control and abatement plan;
To encourage the control of air pollution;
To issue abatement orders;
To control motor vehicle emissions;
To carry out and enforce all provisions of the act.

PROHIBITED ACTS:

- To fail to have new pollution sources approved;
- To violate any department orders;
- To violate other act provisions or regulations.

EXEMPTIONS:

May be granted by department.

PENALTIES:

Fines of up to \$1,000.

PUERTO RICO PESTICIDES

TITLE:

Economic Poison Act
Puerto Rico Laws 5-1001

PURPOSE:

To provide for the control of pesticides through registration and licensing of applicators.

DEFINITIONS:

- | | |
|-------------------------|-----------------|
| 1. Adulterated | 7. Misbranded |
| 2. Device | 8. Person |
| 3. Economic poison | 9. Registration |
| 4. Ingredient statement | 10. Regulations |
| 5. Label | 11. Secretary |
| 6. Labeling | |

ADMINISTERING AUTHORITY:

Department of Agriculture and Commerce

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To enter and inspect property in enforcement of the act;
To regulate the transportation and storage pesticides;
To classify pesticides and restrict their usage;
To license pesticide dealers;
To establish certification standards and certify commercial applicators.

CERTIFICATION OR LICENSING:

Commercial applicators of economic poisons must be licensed; minimum qualifications set forth with commercial farm applicator as only category.

PROHIBITED ACTS:

To engage in commercial application of economic poisons without license;
To sell pesticides without dealer license;
To fail to register pesticides;
To violate other act provisions.

PENALTIES:

Initial offense - fines of from \$100 to \$500;
Subsequent offenses - fines of from \$200 to \$1,000 or from 30 days to six months imprisonment.